intended to place the application in better form for consideration on appeal. An Appendix is provided setting forth the currently pending claims.

The pending application is a divisional application of U.S. Pat. No. 6,335,288 and the claims are computer-related apparatus claims that approximately correspond to the method claims allowed in the parent application. Independent claims 17 and 20 both recite a computer-readable program that includes instructions for implementing a deposition process in accordance with specified limitations. The process implemented by the computer-readable program includes, *inter alia*, a first HDP-CVD deposition, a cooling, an etching, and a second HDP-CVD deposition. The claims limit the types of gaseous mixtures during the steps and limit the deposition/sputter ratio during at least the first HDP-CVD deposition.

The rejections rely primarily on the teachings of Hong, which discloses a PECVD deposition/etching/deposition ("dep/etch/dep") method for depositing a layer in which the etching is performed with a multiple-etch process that includes both a chemical etch and a physical etch (Hong, Col. 2, ll. 24 – 36). This is similar to the prior art discussed by Applicants in the Background of the Invention in their application (Application, p. 2, ll. 16 – 26). The Office Action relies on Hong for its disclosure of a computer-readable storage medium for controlling a deposition process and, in particular, for its disclosure of a dep/etch/dep process (Office Action, p. 2). This teaching is combined with Papasouliotis, which is cited primarily for its disclosure of using a mixture of deposition and inert gases during the deposition portion of the process, and for using a technique during the deposition portion that has both deposition and sputter components (*id.*, p. 3). The Office Action goes on to acknowledge that this cited art does not disclose the step of cooling the substrate, but suggests that it would be obvious to do so in light of the teaching of U.S. Pat. No. 6,015,760 ("Becker").

First, the combination of Papasouliotis with Hong is believed to be improper. In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation to combine the references, together with a reasonable

expectation of success (MPEP 2142). In this instance, Papasouliotis specifically cautions *against* combining its teachings with those describing PECVD dep/etch/dep processes (*see generally* Papasouliotis, Col. 2, ll. 11 – 57). Papasouliotis draws a number of distinctions between PECVD and HDP-CVD processes and notes specifically that "[f]or these reasons, the process sequence ... of PECVD deposition, argon sputter etch, followed by another PECVD deposition, cannot provide void-free filling of high aspect ratio gaps ..." (*id.*, Col. 2, ll. 53 – 56). Since Papasouliotis deliberately suggests that there is *not* an expectation of success in performing a combination with a PECVD dep/etch/dep process, no *prima facie* case has been established.

Second, it is believed that combining the teachings of Becker with Hong and Papasouliotis is also improper. The Office Action refers to Becker as teaching the dependence of a chemical etch on temperature, suggesting that cooler temperatures are preferable (Office Action, p. 3 – 4, *citing* Becker, Col. 2, ll. 36 – 44). In fact, Becker specifically *disagrees* with the language cited in the Office Action, teaching instead that it is preferable to *increase* temperatures:

> The present invention teaches away from current thought, by using increased temperatures to achieve increased selectivity. In addition to improved selectivity, the higher temperatures help reduce the polymer build-up inside the chamber.
> The process of the present invention meets the above-described existing needs by forming an etched multilayer structure, in which the sidewalls of the SiO_2 layer are substantially normal to the substrate, at a high SiO_2 etch rate, and at a high selectivity of SiO_2 with respect to the underlying Si_3N_4. This is accomplished by *heating* various portions of the etch chamber while employing a process for etching the SiO_2 layer down to the Si_3N_4 stop layer.
> (Becker, Col. 2, ll. 54 – 67, emphasis added).

It is clear that Becker is concerned specifically with the need for controlling an etch of SiO_2/Si_3N_4 bilayers sufficiently to stop the etch after the oxide is etched but before the nitride is etched (Becker, Col. 1, ll. 22 – 24). It is not concerned at all with dep/etch/dep processes and has no indication that its teachings could beneficially be applied to such processes. Even if such teachings could be applied, Becker offers no clear suggestion

that it would be desirable to cool the substrate, teaching much more strongly that it would actually be desirable to *heat* the substrate.

Third, the pending claims are allowable based on the allowance of Claim 1 of the parent patent pursuant to MPEP 2106 and the U.S. Patent and Trademark Office's published Examination Guidelines for Computer-Related Inventions ("EGCRI"). With respect to computer-related inventions, EGCRI §IV.B.2.(a)(i) clarifies that when an apparatus claim encompasses "*any and every* computer implementation of a process, when read in light of the specification, the claim should be examined on the basis of the underlying process" (emphasis in original). That section continues with an example of how to recognize such an apparatus claim. It will:

> – define the physical characteristics of a computer or computer component exclusively as functions or steps to be performed on or by a computer, and
> – encompass *any and every* product in the state class (e.g., computer, computer-readable memory) *configured in any manner* to perform that process. *(Id.)*

Application of the standard is illustrated in a hypothetical provided in EGCRI §IV.B.2.(a)(iii) by describing the subject matter to be recited in the patent specification. Specifically, "[t]he disclosure [should state] ... that it would be a matter of routine skill to select an appropriate conventional computer system and implement the claimed process on that computer system. The disclosure [need] not have specific disclosure that corresponds to the [exemplary] limitations recited in the claim (i.e., no specific software or logic circuit)." Under such circumstances, the "[c]laim encompasses any computer embodiment of process claim [and] patentability stands or falls with process claim" (*id.*).

In the present application, Claims 17 and 20 define physical characteristics of computer components as functions performed by a computer. Except for additionally limiting the deposition/sputter ratio for the second deposition, the steps recited in Claims 17 and 20 are similar to those in allowed Claim 1 of the parent application:

1. A method for depositing a dielectric film on a substrate in a process chamber, the method comprising:

(a) providing a first gaseous mixture to the process chamber, the first gaseous mixture comprising a first deposition gas and a first inert gas source;

(b) generating a first high-density plasma from the first gaseous mixture to deposit a first portion of the film on the substrate with a first deposition/sputter ratio within the range of 5 – 20, wherein the first deposition/sputter ratio is defined as a ratio of a sum of a first net deposition rate and a first blanket sputtering rate to the first blanket sputtering rate;

(c) thereafter, cooling the substrate;

(d) thereafter, flowing an etchant gas into the process chamber;

(e) thereafter, providing a second gaseous mixture to the process chamber, the second gaseous mixture comprising a second deposition gas and a second inert gas source; and

(f) generating a second high-density plasma from the second gaseous mixture to deposit a second portion of the film on the substrate, wherein the step of generating a second high-density plasma is performed with a second deposition/sputter ratio within the range of 5 – 20, wherein the second deposition/sputter ratio is defined as a ratio of a sum of a second net deposition rate and a second blanket sputtering rate to the second blanket sputtering rate.

In addition, the specification does not include specific software, i.e. programming code recited to define the aforementioned functions. Rather, it states that computer code executed by a processor "can be written in any conventional computer-readable programming language" (Application, p. 11, ll. 20 – 21), thus indicating that it would be a matter of routine skill to select an appropriate conventional computer system and implement the claimed process on the computer system. Thus, the computer-readable storage medium defined by Claim 17 and the system defined by Claim 20 encompass any and every product in the class configured in any manner to perform the process, which is similar to that of issued Claim 1 of the parent. The allowance of that claim, despite the additional limitation on the deposition/sputter ratio of the second deposition, is thus believed also to render Claims 17 and 20 allowable.

Also, the dependent claims should be patentable by virtue of their dependence from allowable independent claims.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is urged. If the Examiner believes a telephone conference would aid in the prosecution of this case in any way, please call the undersigned at 303-571-4000.

Respectfully submitted,

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